

Why is California Scrambling for Additional Capacity to Meet Summer Demand?

July 12, 2021

On July 1, 2021, the California Independent System Operator (CAISO) announced its intent to procure additional capacity to meet this summer's electricity demand after the California Public Utility Commission (CPUC) and the California Energy Commission (CEC), in a joint letter, urged CAISO to do so.ⁱ California is one of several power regions in the country that have been identified as being at risk of grid emergencies this summer.

U.S. energy emergency risk areas, summer (June–September) 2021



Source: Map by U.S. Energy Information Administration, based on North American Electric Reliability Corporation (NERC) 2021 Summer Reliability Assessment.

Already this summer, record-setting heat waves across the Pacific Northwest have resulted in power outages for thousands of electricity customers. Utilities across the West are implementing rolling blackouts, disconnecting different load centers for a short time to reduce total system electricity demand and maintain the electric grid's stability when not enough resources are available to meet the total electric demand.

In August 2020, when a major heat wave extended across much of the West and wildfires raged in California and neighboring states, as many as 2 million California customers were left without electricity,ⁱⁱ the first rolling blackouts in the state since the California Energy Crisis of 2001. However, August 2020 peak demand of 47,121 MW was far below the state's

record — 50,270 MW on July 24, 2006 — or the 50,116 MW clocked in 2017, when CAISO avoided cutting electric service to its customersⁱⁱⁱ. The biggest difference between the events of August 2020 and the record peak demand days of 2006 and 2017 is California's massive shift away from dispatchable fossil fuel power plants and towards intermittent renewables in the pursuit of meeting its ambitious decarbonization goals.

According to EIA Form-860 data, in 2010 solar and wind capacity accounted for about 5% of CAISO's entire generating fleet, with fossil fuel-fired dispatchable power plants accounting for roughly 70% of capacity.^{iv} A decade later, wind and solar account for almost 30% of total capacity, while the capacity share of coal and natural gas has fallen to less than 50%. Solar, in particular, saw tremendous growth over the last decade, growing from about 1% of CAISO's capacity in 2010 to nearly 20% only ten years later.

Currently, solar generating resources provide most of the electricity needed in California during the midday hours, but solar output falls dramatically in the evening hours when the sun sets but electricity demand remains high. Without enough dispatchable resources available to fill the gap left by these solar resources, demand is liable to exceed available supply. Rolling blackouts may ensue as they did in August 2020, leaving millions of Californians without power to run their air conditioning during excessive heat.

Besides relying on dwindling in-state dispatchable fossil generation to fill the gap left by waning solar output, the California grid operator has grown more reliant on power imports from its neighboring states. Most of these power imports have come from hydropower and fossil fuel-fired power plants, both of which are growing increasingly limited in supply. Nearby states, including Arizona, New Mexico, Nevada, Washington, and Oregon – which all export power to California – have either adopted ambitious renewable portfolio standards or are in the process of doing so. On June 26, 2021, Oregon lawmakers passed the country's most ambitious clean energy standard: 100% CO₂ emissions-free power for the state by 2040^v. Other western states with 100% clean energy targets include California (by 2045)^{vi}, Colorado (by 2050)^{vii}, New Mexico (by 2045),^{viii} and Washington (by 2045),^{ix} while Arizona is still working on its 100% by 2070 target.^x Since 2013, these six states have retired over 10 GW of fossil fuel generating capacity, with much more to come. States that were once able to export their excess dispatchable power generation will soon find themselves in the same situation as California—desperate for imports.

Since California's rolling blackouts of August 2020, nearby states have retired about 4.4 GW of dispatchable fossil fuel-fired capacity, including coal plants Escalante in New Mexico, Cholla unit 4 in Arizona, Centralia unit 1 in Washington, and Boardman in Oregon, according to EIA's Electric Power Monthly^{xi}. According to hourly generation data from the Environmental Protection Agency (EPA) Air Markets Program Data^{xii}, all four coal-fired units ran at 90% of their maximum capacity in the early evening hours (3 pm to 8 pm) during California's August 2020 heatwave (August 17 – August 19). While California itself added or

expects to add about 3.9 GW of new capacity between June 2020 and September 2021^{xiii}, more than half of those resources are stand-alone solar generation, which doesn't address California's challenge of meeting peak demand in the evening hours without increasing its reliance on power imports from resources that have since retired, like the four coal units described above.

Exacerbating California's supply woes is the lack of available electricity from hydropower facilities. The Western U.S. is experiencing one of the worst droughts in its history for the first four months of 2021, or the so-called "rain season." In fact, the 2021 water year so far is the third-driest in 100 years and the driest since 1977.^{xiv} According to the U.S. Drought Monitor,^{xv} 90% of the West is now in drought, with 47% in the extreme or exceptional categories. Higher-than-average temperatures and lower-than-average precipitation in April and May have accelerated snowmelt, which was absorbed into the already dry ground rather than flowing into streams, rivers, and reservoirs. Forecasted inflows to Lakes Powell and Mead are 34% of normal. The nation's largest reservoir, Lake Mead, is headed for its lowest level since it was first filled in the 1930s.^{xvi} As a result, the CPUC and CEC, in their joint letter to CAISO, estimate that these drought conditions have already reduced California's hydro capacity by 1,000 MW. Nearby states, like Oregon and Washington, are also experiencing much lower-than-average water levels in their reservoirs, reducing available hydropower generation that California has often relied on in the past to meet its electricity demand during summer heat waves.

None of the issues that have California scrambling for additional generating resources to meet electricity demand this summer were completely unexpected. While recent heatwaves in 2020 and 2021 set temperature records across certain areas, electricity demand remained below previous record levels. Fossil fuel retirements across the region have been announced years in advance, driven by regulatory pressure from state agencies on utilities to decrease their reliance on fossil fuels to achieve politically driven ambitious decarbonization goals. While recent drought conditions have resulted in much lower-than-average water levels at hydropower dams across much of the West, regulators were well aware that these conditions were likely to occur, as they have in the past. However, California regulators seemed to have failed to consider all of these factors simultaneously, or if they did, underestimated their true impact. To make matters worse, California's only remaining nuclear plant—PG&E's 2,200-MW Diablo Canyon—is slated to be fully retired by 2025, without clear plans on how to reliably replace this massive amount of capacity.

Poor resource planning in California and much of the West means that rolling blackouts like the ones Californians experienced last summer will be a looming risk in the region for the foreseeable future. Let's make sure that the rest of the country learns from California's mistakes.

Note- This blog was originally posted on July 7, 2021. This is an updated version that reflects updated reporting on issues in California and neighboring states.

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- i <https://www.caiso.com/Documents/CapacityProcurementMechanismSignificantEvent-JointStatementandLetter.pdf>
 - ii <https://www.utilitydive.com/news/california-power-outages-underscore-challenge-of-maintaining-reliability-du/583727/>
 - iii <https://www.caiso.com/documents/californiapeakloadhistory.pdf>
 - iv <https://www.eia.gov/electricity/data/eia860/>
 - v https://www.huffpost.com/entry/oregon-clean-energy-bill_n_60d79c4ce4b0dcd799a7851b
 - vi <https://www.npr.org/2018/09/10/646373423/california-sets-goal-of-100-percent-renewable-electric-power-by-2045>
 - vii <https://www.utilitydive.com/news/colorado-gov-polis-unveils-roadmap-to-100-carbon-free-by-2040-signs-11-cl/555975/>
 - viii <https://www.greentechmedia.com/articles/read/new-mexico-sends-100-carbon-free-bill-to-governor>
 - ix <https://www.governor.wa.gov/sites/default/files/documents/clean-electricity-policy-brief-bill-signing.pdf>
 - x <https://www.canarymedia.com/articles/arizona-passes-rules-requiring-100-percent-clean-energy-but-on-a-longer-timeline-than-originally-proposed/>
 - xi <https://www.eia.gov/electricity/monthly/>
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 - xiii <http://www.caiso.com/Documents/2021-Summer-Loads-and-Resources-Assessment.pdf>
 - xiv <https://www.latimes.com/world-nation/story/2021-06-19/western-united-states-drought>
 - xv <https://droughtmonitor.unl.edu/>
 - xvi <https://www.npr.org/2021/06/09/1003424717/the-drought-in-the-western-u-s-is-getting-bad-climate-change-is-making-it-worse>